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Co-creation between Customer and Firms: Modelling, Empirical Application and Managerial Implications

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Abstract: Companies rely increasingly on dynamic customer community to access new ideas and test them. Identify customer characteristics that will ensure the success of this relational exchange is therefore essential for managers. Our research aims to address this need. An empirical study of practitioners operating in innovative companies shows that the customer knowledge management, participation, intensity of use, experience, implication, and communication have a positive effect on co creating new products and services. Time and complexity of products and co-create services have a negative effect. The degree of participation is influenced by the intensity of use, experience, implication, communication, time and complexity of products and services to co-create. Similarly, customer knowledge management is influenced by the narrative capacity, experience and time.

Key words: innovation; co-creation; knowledge management; new products; collaboration
JEL code: O350

1. Introduction

Today's customer is not any more the passive customer, half-Pavlovian who reacted to stimulations of advertising and promotion: he would have become proactive and ready to collaborate with companies. Several studies have focused on this new customer by assigning different status Cova (2008), the questions are: What are the factors that influence the co-creation process products/services? What are the characteristics of customers for optimal collaboration? Thus, the theory of the primacy of affect postulates that the successful co-creation is a direct result of knowledge management but also the result of good customer participation in this process. The aim of our research is on the one hand to better outline the contours of customers co-creating with companies, and secondly to determine the main characteristics of these customers for better collaboration.

2. Theoretical Framework and Hypotheses

The concept of CKM (customer knowledge management) has been recognized as a powerful tool that every company must have and develop, in order to guarantee its survival and exceed its competitors. For example we can mention some definitions of researchers who are interested in the management of customer knowledge, such as Ivens and Mayrhofer (2003), "*the exchange of information is a set of coherent information constitutes a*

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requisite for any decision. This exchange may be useful to the partner and represents a clear advantage for customers and companies and it can be considered as a proof of confidence". According to Stone (2009), knowledge management aims to exploit the intellectual capital residing in an organization. However, within the business knowledge (employee skills) are no longer sufficient to ensure its success and maintain its market position.

Indeed, according Pension et al. (2013), knowledge management can be considered the technological vehicle that facilitates the sharing and transfer of knowledge for the survival and success of the company. Su et al. (2005) have proposed the incorporation of a technical operating data in the Model CKM. They said that product innovation should be linked to the knowledge of the needs and preferences of customers.

We may find that all these studies and research affirm the importance of the interest in the management of customer knowledge. According to Rollins and Halinen (2005), we must manage knowledge related to customers in a more effective manner. Today, with the changing role of the customer through its transition from passive to proactive state, the numbers of companies counting on customer knowledge to design a product/service are growing. Because they are fully aware of the potential value to create with customers. And here we talk about "co-creation". The consideration of customer participation is part of an emerging paradigm where the customer is contributor and creator (Pitt et al., 2006). The paradigm of co-creation considers customers as employees of the knowledge held on the products or services. As for Shaw et al. (2011), they bring a distinct contribution to the literature suggesting that organizations must implement co-creation strategies with customers in order to be able to innovate new products/services. But the question is: Who are the customers who are now working with companies?

From these arguments we can make our first hypothesis

H1 our causal model: Co-creating product/service is positively influenced by customer knowledge management (H1a); and the degree of customers participation (H1b).

Customers "lead users", considering the relationship between the company and the customer as a collaboration, these customers are characterized by "skills more directly linked to the use" of a product, service or media (Internet). Hippel (1978) defined the leading users as experts users to the forefront of a field with an interest in that it evolves to meet their expectations by imagining ways to improve existing products.

The lead users have the ability to know the needs that are expressed by many users of this market (Hippel, 1986). According to Fuller et al. (2007), these customers can develop online communities for different brands or other products. Like Marion (2003), some authors call this type of customers "precursors". In the sense that they anticipate the market (Hippel, 1986). More recent research Fuller (2010), showed that customers leader are more likely to participate in co-creating operations, than their less creative counterparts. Previous research has thus also shown that the high level of product usage generates positive relationships on innovation and on development costs compared to the innovation achieved with users "less users" (Luethje, 2004). These skills allow them a legitimate speaking about the product, service or media in question, to propose other features, see other uses. Some see it as a form of democracy in innovation (Levy, 1994). The acquisition of knowledge and skills allows customers to modify and improve the use of a product. This allows us to present the following hypothesis:

H1-a: Co-creation of product/service is positively influenced by customer knowledge management.

H1-b: Co-creation of product/service and is positively influenced by the level of customer participation.

However, companies must identify the different categories of customers about what they should do to involve them in the co-creation process. We begin by quoting the lead users who are characterized by their intensity of use:

they are expert users at the forefront of a field and having interest in it evolves to meet their expectations imagining ways to improve existing products (Von Hippel, 1978). These customers are able to know the needs that will be expressed by many users of this market. Previous research has shown that the high level of product usage generates positive relationships on innovation and on development costs compared to the innovation achieved with users unless users (Luethje, 2004). We formulate the following hypothesis:

H2-a: The intensity of use has a positive and direct effect on the co-creation of new products/services.

Knowledge and frequent use of a product by customers enables them to determine the characteristics of a new product that will be enjoyed by other customers. Shih and Venkatesch (2004) proposed a conceptualization of the use of innovations they have implemented in the field of innovation adoption of domestic technologies. They have advanced in their approach, based on the work of Rogers (1995) on the adoption of innovation, and the time required for the customer adopts or rejects the new product. This allows us to pose the following hypothesis:

H2-b: The intensity of use has a positive and direct impact on the customer knowledge management.

In addition, lead users considering the relationship between the company and the customer as a collaboration. According to Fuller et al. (2007), these customers can develop online communities for different brands or other products. Recent research by Fuller (2010) showed that customers leader are more likely to participate in co-creating operations, than their less creative counterparts. We formulate the following hypothesis:

H2-c: The intensity of use has a positive and direct impact on the degree of participation.

A second category of customers has been identified: these officers customers, known for their narrative ability. The best way to lead people to venture into unknown field is to make the familiar and desirable land in the first bringing it in their imagination (Tichy & Cohen, 1997). Eventually, customers will be required to construct a narrative implementing their experiences with the product/service, which could also give ideas for companies to innovate and to provide solutions for some products/services in difficulty (Denning, 2002). In fact, two people can have the same amount of information but differently their opinions on the performance of a product and the reasons for their choice (Green & Gilhooly, 1992). Thus, the customer, the story drawn from his imagination, could help the company refine its research and better meet customer expectations. Based on these arguments, we present the following hypothesis:

H3 -a: The narrative capacity has a positive and direct effect on the co- creation of new products / services.

H3 -b: The narrative capacity has a positive and direct impact on the customer knowledge management.

The third category identified of customer groups the customers experts known for their degree of experience. Nambisan (2007) studied the customer experience through real interactions in the context of products online forums. He showed that customer interactions in the co-creation of value can be a significant source of value, because they form a cognitive, social and hedonic favorable. We therefore propose the following hypothesis:

H4-a: The degree of experience has a positive and direct effect on the co-creation of new products or services.

In addition, customer interactions help in expanding the effective participation. The results reveal that the actual experiences of customers and their beliefs about the benefits, expected to significantly affect much their real participation and continuously (Nambisan, 2007). We therefore ask the following hypothesis:

H4-b: The degree of experience has a positive and direct impact on customers knowledge management.

H4-c: The degree of experience has a positive and direct impact on the degree of participation.

The fourth category of customer groups the customers of power, which are characterized by information processing. Yuosre (2012) affirms that the improvement of the characteristics of communication and coordination

between the members of a team can push them to begin more in the tasks which they were appropriate. Indeed, customer attitudes are manifested by research and treatment of systematic and heuristic information (Helme-Guizon, 2001). Thus, the more the information received by the customer is treated carefully and seriously, the effect of co-creation of new products/services will be positive. We therefore ask the following hypothesis:

H5: The treatment of information has a positive and direct effect on the co-creation of new products or services.

Finally, a fifth category of customer has been identified: these workers customers, who are known for their degree of implication, particularly in the context of online groups (Forsythe, 2003), electronic interactions and communities in the virtual co-create goal (Szmigin et al., 2005). It is this involvement that allows customers workers to have a better service experience (Groth, 2005), and results in reduced costs for the company. This can then consider the customer-employed as an internal agent (Manolis, 2001), and not as a simple external receiver value. We therefore ask the following hypothesis:

H6-a: The degree of implication has a positive and direct effect on the co-creation of new products/services.

H6-b: The degree of implication has a positive and direct impact on the degree of participation.

The diffusion of innovation is achieved through external communication channels and interpersonal channels (Rogers, 1995). As Alcouffe et al. (2003) show, to ensure that innovations are disseminated, it is necessary that the channels of communication must be powerful. Communication channels must also be relevant to better convince customers to collaborate and participate in the operation. We therefore ask the following hypothesis:

H7-a: The intensity of communication efforts has a positive and direct impact on the degree of participation.

H7-b: The intensity of communication efforts has a positive and direct impact on customer knowledge management.

The adoption rate is defined as the relative speed with which the members of a social system adopt an innovation (Rogers, 1995). It is usually measured by the time required for a certain percentage of the members of a social system to adopt an innovation (Rogers, 1995). We therefore propose the following hypothesis:

H8-a: Time has a negative and direct effect on the co-creation of new products/services.

H8-b: The time has a negative and direct impact on the customer knowledge management.

H8-c: The time has a negative and direct impact on the degree of participation.

The complexity of the product/service can represent an barrier or catalyst to the dissemination or interpretation of customer information (Rogers, 1995). “An innovation is perceived as offering benefits in terms of economic efficiency, reduction of disadvantages, a saving of time or effort, or social prestige gain. Compatibility corresponds to the fact that innovation is perceived as consistent with the values, beliefs and past experience of potential users” (Vas & Coeurderoy, 2004). An operation co-creation of products/services should be seen as a solution by customers and not a problem to solve. We therefore propose the following hypothesis:

H9-a: The complexity of products or services to co-create has a negative and direct effect on the co-creation of new products or services.

H9-b: The complexity of products or services to co-create has a negative and direct impact on the degree of participation.

So we introduce our causal model below presenting our variables and our hypothesis of research.

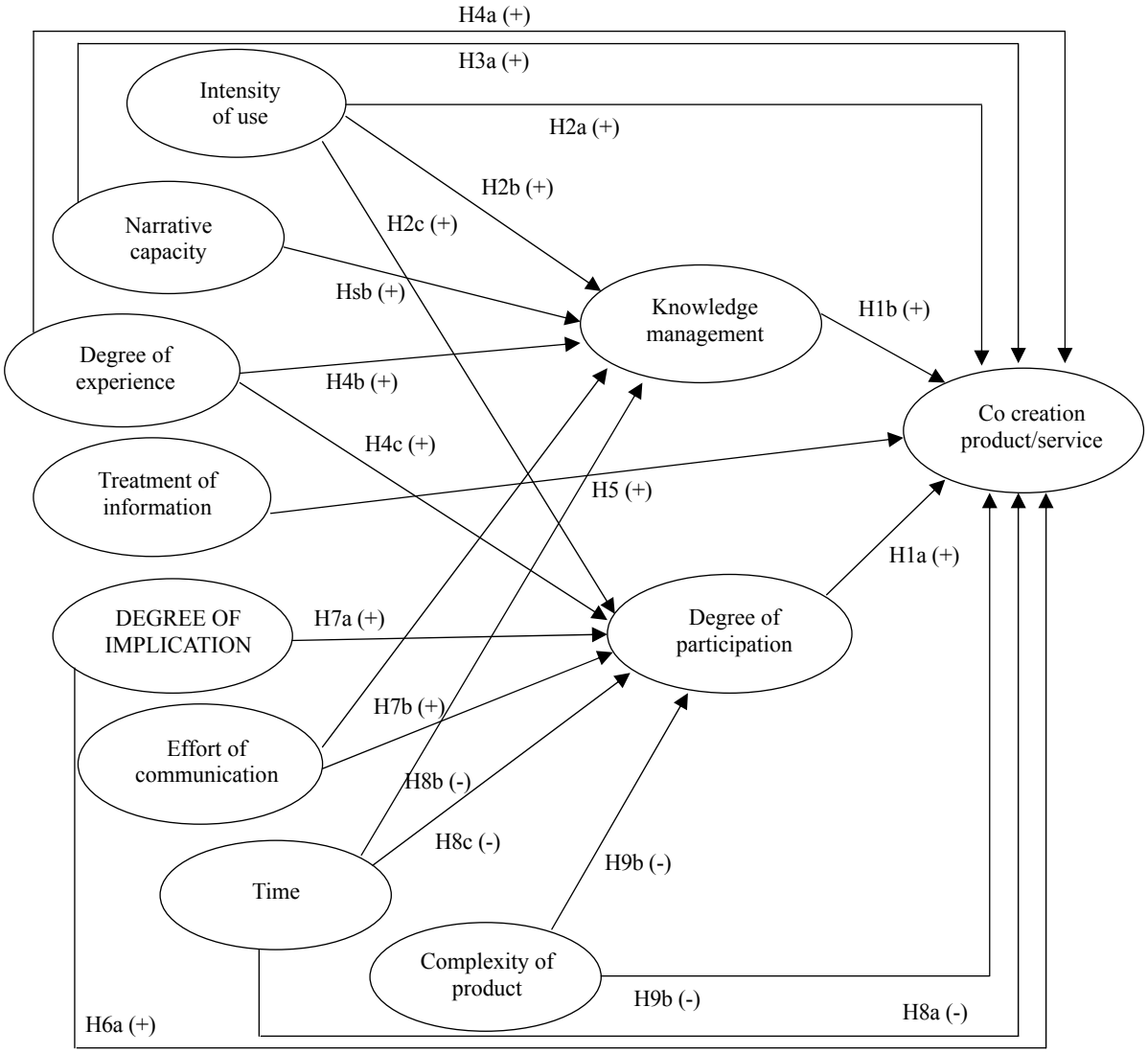

Figure 1 The Causal Model of the Co-creation of Products/Services

3. Data Collection

The first methodological choice was to opt for a mail survey that we send it to the innovative companies. We chose to administer the survey online, or CAWI ("*Computer Assisted Web Interview*" or programmed online survey). Since our survey has a complex structure (presence of many filters, references, etc.). Moreover, the presence of certain issues on data or confidential information classified by business, and administering the survey by internet can minimize refusal answers by our target. Finally, after sorting and selection of 2225 contacts of different innovative firms in France, a survey were sent to marketing managers and experts, we have collected 230 usable answers divided into ten sectors: (1) hardware, (2) pharmaceutical and chemical industry (drugs, drugstore products, paints and varnishes), (3) food industry (4) health/Beauty/cosmetics (perfumes and toilet preparations), (5) automobile (and equipment), (6) equipment and tooling (7) textile (sports goods and clothing), (8) appliances (9) communications and telecommunications agencies (advertising agencies, press), (10) banks and insurance. For almost all of the survey, the extent of responses is by Likert scales.

3.1 Data Processing Methods and Results

We achieved without rotation measurement scales ACP on all 11 variables in our model. In the event that the interpretation of factors is difficult, a second ACP was carried out with orthogonal rotation (Varimax) to increase the value of the factor loadings of the items with the factors considered. Thus, we present the results of factor analyzes of our sample, as well as the coefficient of Cronbach's alpha used to check the reliability of our measurements. Six of the 39 items that we had at the beginning were removed. Finally, the average score of the Cronbach's alpha for all scales of 0.7 and this reflecting a reliability quite satisfactory.

Through Table 1, we summarize the number of items retained at the end, for each measurement variable.

Table 1 Reliability Measuring Statistical Variables: Cronbach's Alpha

Dimension	Cronbach's Alpha	Number of selected items
Co creation product / service	0.686	5/3
Intensity of use	0.833	3/3
Narrative Capacity	0.662	3/3
Degree of experience	0.645	3/3
Treatment of information	0.680	3/3
Degree of implication	0.650	3/3
Effort of communication	0.723	3/3
Time	0.730	3/3
Complexity of product	0.769	3/4
Knowledge Management	0.842	3/5
Degree of participation	0.732	3/4

We validated measurement tools for testing confirmatory factor analysis models available in the structural equation software "Amos". Then we tested our global measurement model. The fit indices of the overall measurement model show a good level of fitting the model proposed to the collected data.

Indeed, the absolute indexes GFI and AFM have acceptable values compared to the required thresholds (respectively 0.906 and 0.875). The CMA is equal to 0.078. Similarly the comparison indications that the overall measurement model approaches the saturated model: TLI and CFI indexes have more than 0.5 values. The parsimony indices are also lower than the indices of the saturated model. Finally, we checked the adequacy of our structural model, below, the data based on adjustment statistics indices.

Table 2 Indices of Quality Measurement Model Fit

Indices Adjustment	Actual value
$\chi 2$	318.640
Degrees of freedom	226
P	0.000
$\chi 2$/ Degrees of freedom	1.410
GFI	0.906
AGFI	0.875
RMR	0.078
RMSEA	0.041
TLI	0.983
CFI	0.986
BIC of the model	727.229 < 1656.438
CAIC of the model	801.229 < 1956.438

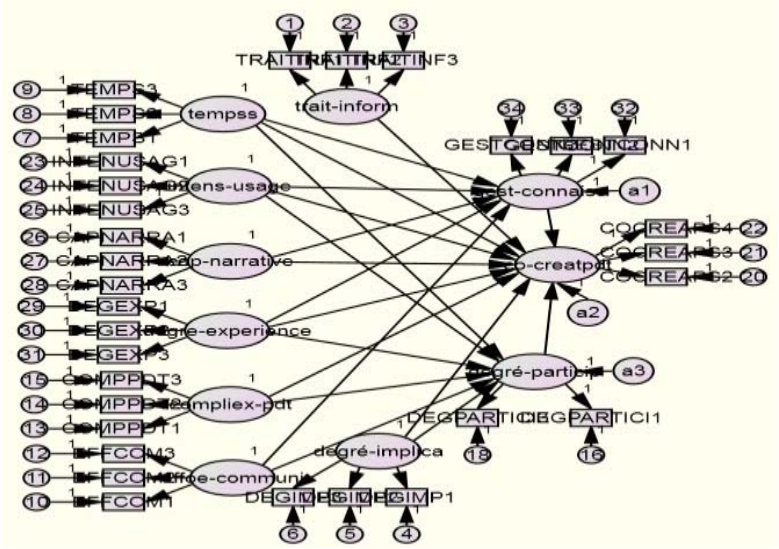

Figure 2 The Structural Model

Table 3 Indices of Quality of Structural Adjustment Model

Indices Adjustment	Actual value
$\chi 2$	365,293
Degrees of freedom	231
P	0,000
$\chi 2$/ Degrees of freedom	1,581
GFI	0,892
AGFI	0,860
RMR	0,106
RMSEA	0,048
TLI	0,976
CFI	0,980
BIC of the model	746,274 < 1656,438
CAIC of the model	815,274 < 1956,438

The results of the structural model of the AFC are satisfactory. All relationships are significant at the 1% level. The test of the x^2 (365.293; $p < 0.000$) is significant and the fit indices is less than 3. The absolute fit indices (GFI = 0.892) is almost equivalent to the threshold often advocated by many authors (GFI = 0, 9) and the AFM = 0.860 is greater than the fixed value (0.8).

The value of the CMA is acceptable (RMR = 0.106) as it does not exceed 0.1. The RMSEA of 0.048 value is satisfactory (as RMSEA < 0.05).

The incremental index (TLI = 0.976; CFI = 0.980) are both greater than 0.9. Therefore, they are very satisfactory. The BIC and CAIC model are lower than the saturated model. Therefore, we can conclude a good fit.

4. Discussions of the Main Results

Before we begin our discussion, we present a summary table grouping all our variables and search results.

Table 4 Synthesis of Results

Variable Effect	Variable Cause	Sense	P	Results
Degree of participation	co-creation of product/service	+	P = ,000	H1a validated
Knowledge Management	co-creation of product/service	+	P = 0,014	H1b validated
Intensity of use	co-creation of product/service	+	P = ,000	H2a validated
Intensity of use	Knowledge Management	+	P = 0,154	**H2b rejected**
Intensity of use	Degree of participation	+	P = 0,023	H2c validated
Narrative capacity	co-creation of product/service	+	P = 0,106	**H3a rejected**
Narrative capacity	Knowledge Management	+	P = ,000	H3b validated
Degree of experience	co-creation of product/service	+	P = ,000	H4a validated
Degree of experience	Knowledge Management	+	P = 0,001	H4b validated
Degree of experience	Degree of participation	+	P = ,000	H4c validated
Treatment of information	co-creation of product/service	+	P = 0,512	**H5 rejected**
Degree of implication	co-creation of product/service	+	P = ,000	H6a validated
Degree of implication	Degree of participation	+	P = ,000	H6b validated
Effort of communication	Knowledge Management	+	P = ,000	H7a validated
Effort de communication	Degree of participation	+	P = 0,114	**H7b rejected**
Time	co-creation of product/service	-	P = 0,023	H8a validated
Time	Knowledge Management	-	P = 0,017	H8b validated
Time	Degree of participation	-	P = ,000	H8c validated
Complexity of product	co-creation of product/service	-	P = ,000	H9a validated
Complexity of product	Degree of participation	-	P = ,006	H9b validated

Our results showed that the management of knowledge and the degree of participation play a very important role in the process of co-creation of products/services. They further showed that customers own characteristics contributed to the success of the co-creation process. Thus, intensity of use, experience, implication, and communication have a positive effect on the co-creation of new products and services. Time and complexity of products and co- create services have a negative effect. The degree of participation is influenced by the intensity of use, experience, implication, communication, time and complexity of products and services to co- create. Similarly, customer knowledge management is influenced by the narrative capacity, experience and time.

5. Conclusion

With the emergence of customer collaborator, the companies are quickly directed to the customers on account of the potential value they can bring. In fact, companies have already noticed that the knowledge detained by the customer is necessary. However, it is important to respect well the conditions for effective collaboration. After a state of the art of literature, an experiment was implemented in 230 innovative companies. Quantitative analysis of the data allowed the validation of our theoretical model. 20 hypotheses were tested of which 16 have been validated, and to demonstrate that companies should be more sensitive to information detained by customers. We must also ensure well inform the staff and prepare them to manage well the customer knowledge. Our search also shows that companies can make a difference between several categories of customers allowing them to enhance the quality of co-creation: the company could classify customers according to their degree of creativity perceived by everyone.

If we try to generalize our results, it would be appropriate to consider a study in other private and public sectors which record a high level of customer knowledge services such as hospitals or private clinics, postal

services, rail or air transport.

It would also be interesting in future paths of research to conduct cross survey of innovative companies with their customers in order to compare the two visions. This will also allow us to identify customer knowledge management and their shareholdings. But also, this will give us the opportunity to validate the results on a larger scale.

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